

Donaldson Company

Connecticut School Bus Retrofit Program

February 25, 2004

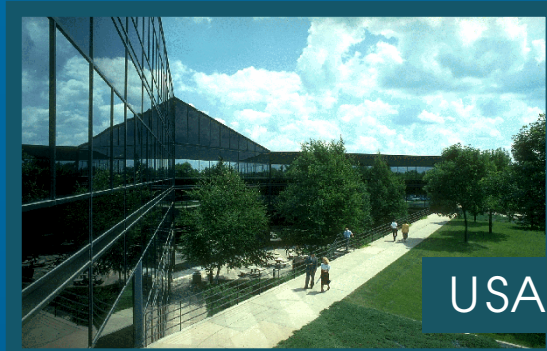


Topics

- Donaldson Company Overview
- History in Emissions Market
- Retrofit Technologies
- Donaldson's 'Total Emissions Approach'
- Current involvement in retrofit market



Donaldson Company, Inc.



USA(MN)

Key Sales &
Technical
Center
Locations



Belgium



Singapore

- Over \$1.2 billion annual net sales
- Over 9000 employees worldwide
- Over 38 assembly and manufacturing facilities in 19 countries
- Three joint ventures
- Worldwide sales, engineering and distribution



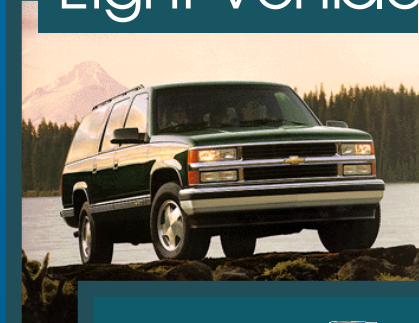
Diverse Filtration and Exhaust Experience Engine Applications

Medium- and Heavy-duty Trucks

Off-road Equipment



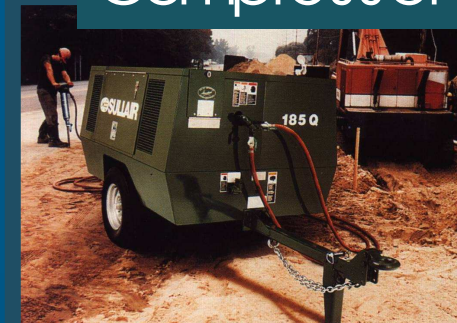
Light Vehicle



Defense



Compressor Products



Current Customer Relationships



BOEING



FREIGHTLINER[®]
LLC



Hino



NAVISTARSM



FMC

CATERPILLAR[®]



XEROX

Seagate



JOHN DEERE

Kubota

PACCAR



DETROIT DIESEL
CORPORATION



VOLVO

GENERAL DYNAMICS



DAIMLERCHRYSLER

Emissions/Exhaust Experts

- Over 50 years of experience w/ medium & heavy duty diesel engines
- 5 patents on catalytic converter systems
- 19 patents on diesel particulate filter systems
- 18 SAE papers published regarding emission reduction



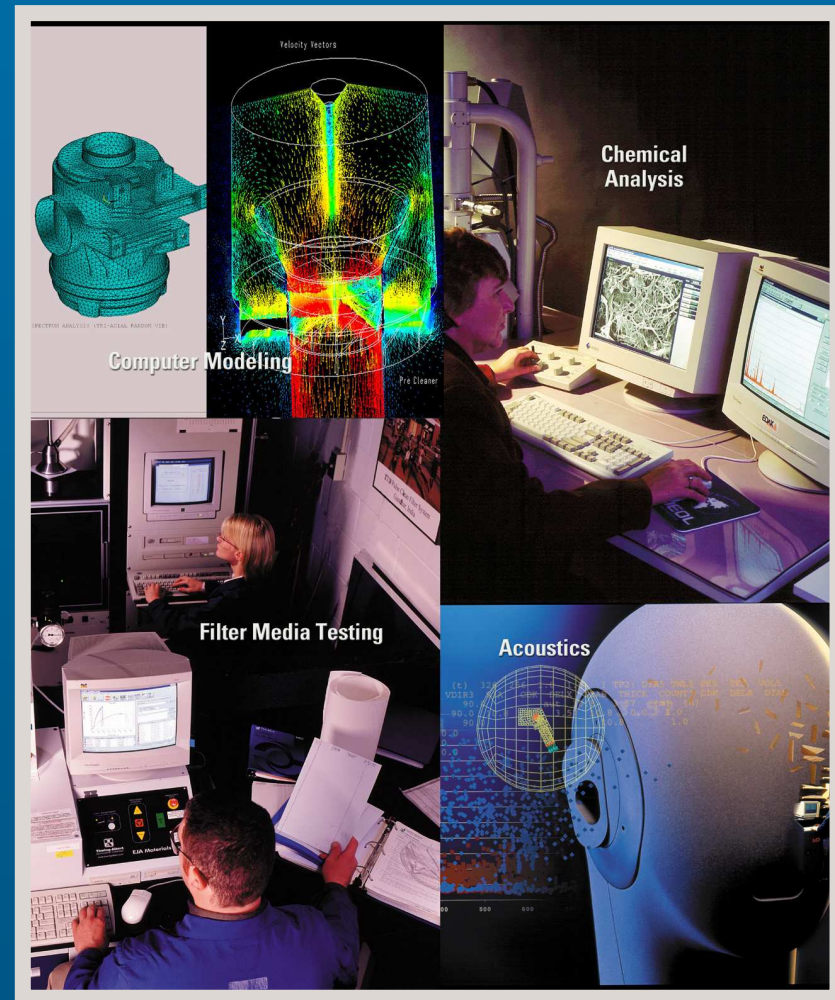
Emission Control Experience

- ~ 2000 DPF systems in service in early 90's
- Urban Bus Particulate Traps
- DDC and Cummins Engines



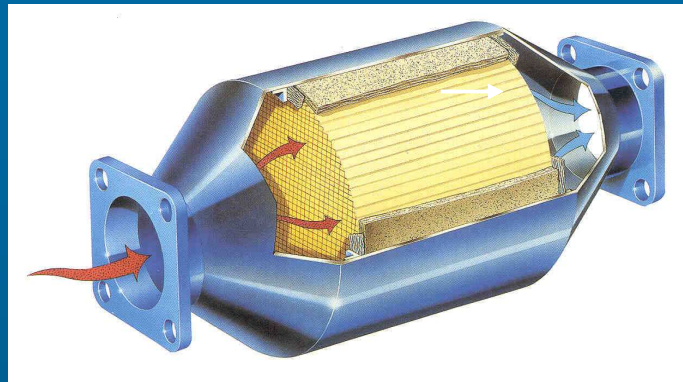
Emission Control Experience

- More than 500,000 DOC's sold since 1993
- Medium Duty Truck DOC Muffler Program
- Requested by Engine Companies
 - Caterpillar, Cummins, Mack, Isuzu, Mitsubishi



Diesel Emission Reduction Technologies

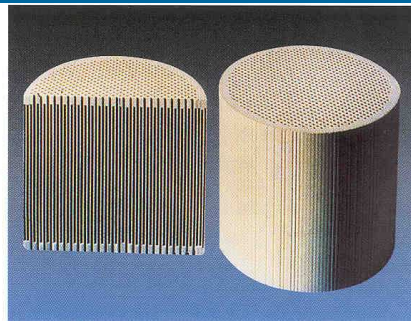
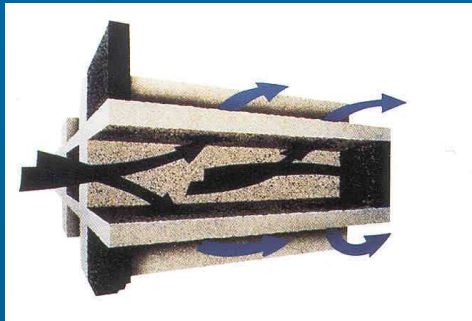
Diesel Oxidation Catalyst (DOC)



- Reliable – Donaldson has installed over 500,000 DOC's since 1993
- Provides 20 –30% PM reduction
- Direct replacement to existing muffler
- Runs on standard diesel fuel (< 500ppm sulfur)

Diesel Emission Reduction Technologies

Diesel Particulate Filter (DPF)

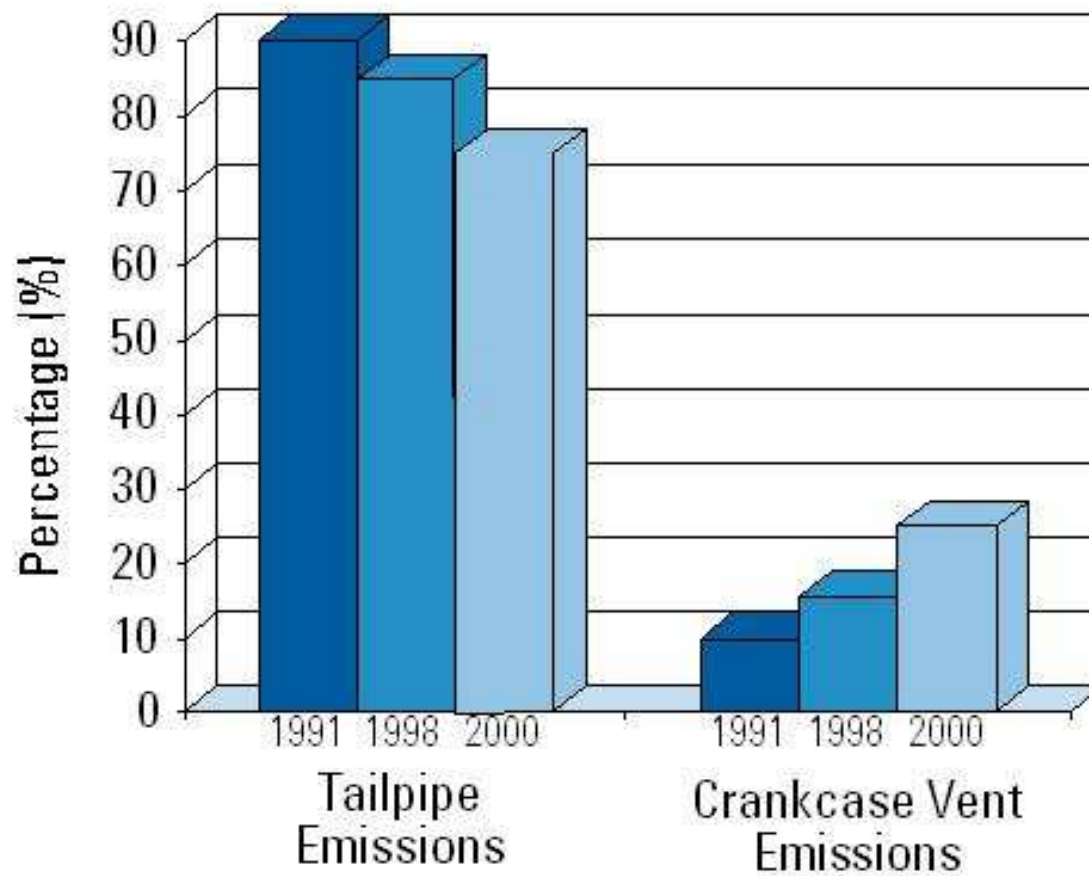


- Provides up to 90% PM Reduction
- Limitations
 - Ultra low sulfur diesel required
 - Exhaust temperature limits
 - Filter must be cleaned at 50,000 miles

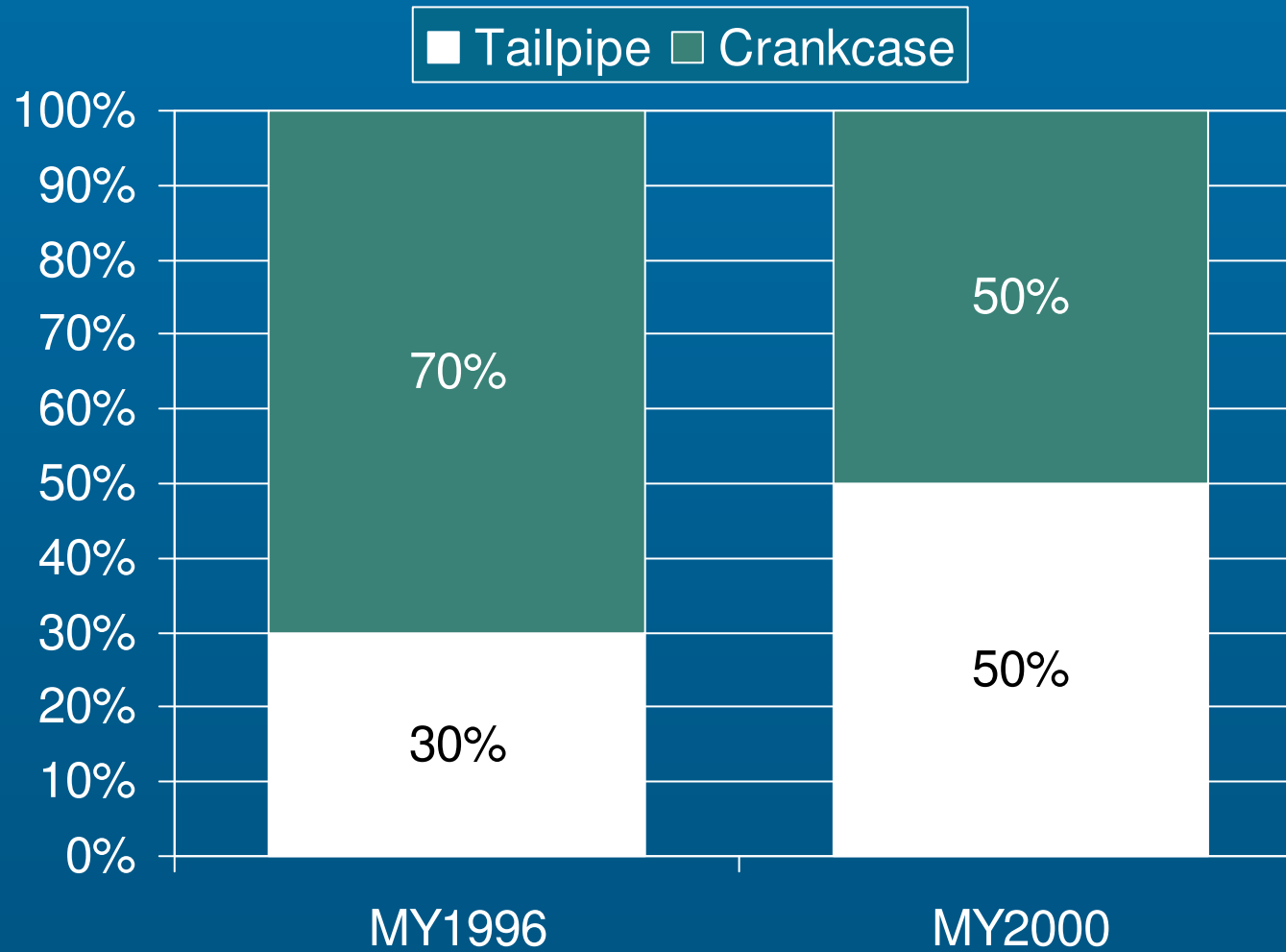
'Total Emissions Approach'

- Both tailpipe and crankcase vents are emission sources
- Open crankcases emit blow-by emissions into the environment
- Crankcase emissions account for a significant amount of particulate matter

PM During Load



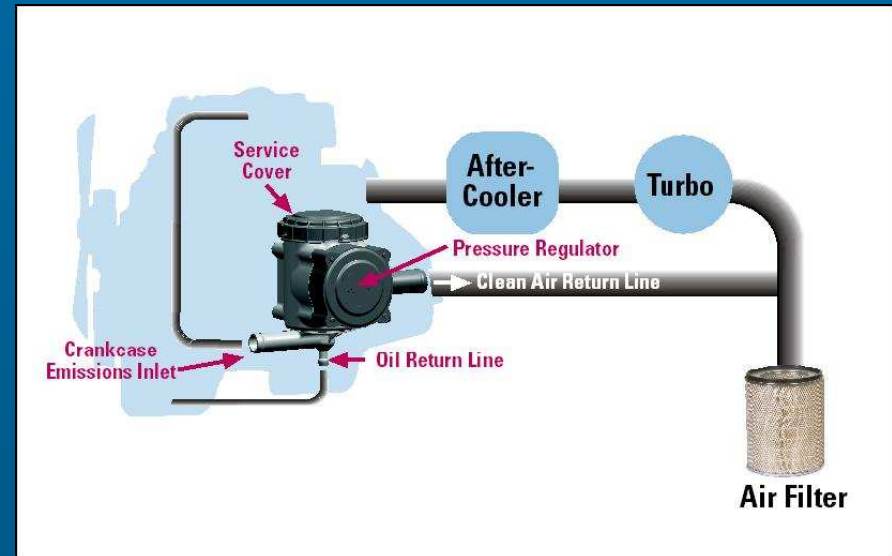
PM at Idle



Diesel Emission Reduction Technologies

Spiracle™ Crankcase Filter

- Eliminates emissions from crankcase
- Two stage filter protects engine
- Filter change required every 15-25k miles



Donaldson Technology Solutions

- Diesel Oxidation Catalysts (DOC)*
- Diesel Particulate Filters (DPF)**
- Spiracle™ Crankcase Filtration
- Combine for Maximum Emission Reduction
 - DPF plus Spiracle™ Crankcase Filtration***
- Combine for Highest Cost-Benefit
 - DOC plus Spiracle™ Crankcase Filtration*

* EPA & CARB Verified

** EPA Verified using Engelhard technology

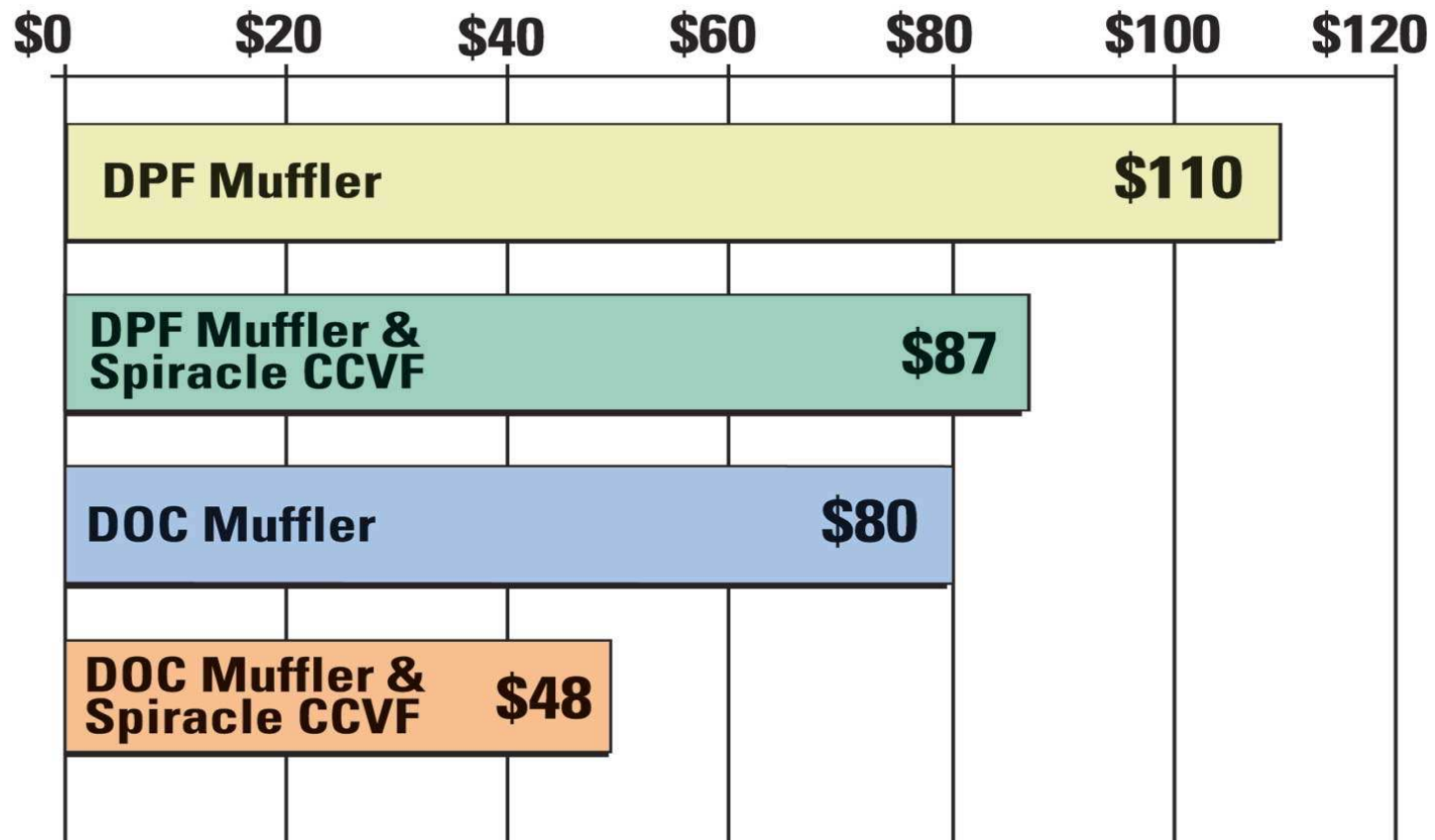
*** Under review with EPA



Cost & Effectiveness Summary

Donaldson Solutions		#1 DPF Muffler		#2 DPF Muffler & Spiracle CCVF		#3 DOC Muffler & Spiracle CCVF		#4 DOC Muffler	
	Contribution to Emissions	Percentage Reduction	Relative Contribution	Percentage Reduction	Relative Contribution	Percentage Reduction	Relative Contribution	Percentage Reduction	Relative Contribution
Tailpipe Emissions	75%	85%	64%	85%	64%	20%	15%	20%	15%
Crankcase Emissions	25%	0%	0%	100%	25%	100%	25%	0%	0%
Total Emissions Reduced		64%		89%		40%		15%	
Cost		\$7,000		\$7,700		\$1,900		\$1,200	
Cost for each percent of emissions reduced		\$110		\$87		\$48		\$80	

Cost Per % of PM Reduced



Donaldson DPF + Spiracle

- Highest Total Emission Reduction
- Over 96% (Cal-Riverside 2003 study)
- Spiracle eliminates crankcase emissions and reduces in-bus odors
- Requirements
 - Must use ULSD
 - Temp data logged prior to approval
 - Filter must be cleaned at 50,000 miles



Donaldson DOC + Spiracle

- Most cost effective solution
- EPA verified (ETV protocol program)
- Does not require special fuel
 - No fuel additives needed
 - Runs on standard on-road diesel fuel
 - Compatible with Biodiesel fuel
- Spiracle reduces in-bus odors
- DOC provides direct replacement of old muffler
- No duty cycle requirements



Donaldson Retrofit Approach

- Develop relationships w/ associations
 - EPA
 - CARB
 - MECA
 - Air Quality Agencies



Donaldson Retrofit Approach

- State & National Associations
 - New York State Energy Research & Development Authority (NYSERDA)
 - New York Power Authority (NYPA)
 - National Association for Pupil Transport (NAPT)
 - National School Transportation Association (NSTA)

Emissions Project Involvement

- NYSERDA
 - School's specifying Donaldson's DOC plus Spiracle awarded over \$2.2m for 1100 school buses
- Clean School Bus USA
 - Corning Painted Post, NY = DPF or DOC + Spiracle
 - NSTA = DOC + Spiracle
- Washington State –
 - Providing Spiracles so they can include in 2005 plan
- Los Angeles School districts
 - 100 DPF's with major school bus company



Donaldson's offer to you

- DOC+Spiracle
 - Most cost effective system
- DPF+ Spiracle
 - Highest Total Emission Reduction
- EPA verified products
- 4yr/100,000 mile warranty
- Technical support
- Train, assist, or provide installation

